METHOD OF MAKING A SINGLE-CELL WINDOW COVERING

Cross Noting to Related Applications

[0001] This application claims the benefit of provisional patent Application Serial No. 60/197,063, filed on April 13, 2000.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] This invention relates to an improved method for making single-cell honeycomb type window coverings.

Description of the Related Art

[0003] In the past, single-cell honeycomb type window coverings have been made by a variety of techniques. One technique, disclosed in U.S. Patent No. 4,450,027 to Colson, involves folding a continuous strip of fabric into a tube, applying adhesive to the exterior of the tube and then winding the tube onto a rotating rack so that the adjacent windings of the stacked tube are bonded together to form a honeycomb array or stack of cells of single-cell thickness. Another technique, disclosed in U.S. Patent No. 4,288,485 to Suominen and U.S. Patent No. 5,630,898 to Judkins, cuts through the full depth of a collapsed multiple-cell width honeycomb array of cells to remove a single-cell width column of cells.

SUMMARY OF THE INVENTION

[0004] The method of the present invention begins with a previously formed multiple-cell width honeycomb array of cells. Only selected internal ligaments are severed to form either a single-cell width product or a product wherein the stack of cells includes both multiple-cell width portions and single-cell width portions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Figure 1 is an illustration of the prior art disclosed by Corey et al.

[0006] Figures 2a and 2b illustrate a plan view of the product of Fig. 1 after the internal ligaments have been severed in accordance with a first embodiment of the invention.

[0007] Figures 3a and 3b illustrate a plan view of the product of Fig. 1 after the internal ligaments have been severed in accordance with a first alternate embodiment of the invention.

[0008] Figures 4a and 4b illustrate a plan view of the product of Fig. 1 after the internal ligaments have been severed in accordance with a second alternate embodiment of the invention.

[0009] Figures 5a and 5b illustrate a plan view of the product of Fig. 1 after the internal ligaments have been severed in accordance with a third alternate embodiment of the invention.

[0010] Figures 6a and 6b illustrate a plan view of the product of Fig. 1 after the internal ligaments have been severed in accordance with a fourth alternate embodiment of the invention.

[0011] Figures 7a and 7b illustrate a plan view of the product of Fig. 1 after the internal ligaments have been severed in accordance with a fifth alternate embodiment of the invention.

[0012] Figures 8 and 9 illustrate a means for severing the ligaments in accordance with the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] In the preferred embodiment of the invention, the starting product is a multiple-cell width honeycomb array of cells formed by the process disclosed in U.S. Patent No. 5,193,601 to Corey et al., the entire contents of which is herein incorporated by reference. The process disclosed in the '601 patent results in the multiple-cell width honeycomb, collapsible, fabric product 10 shown, in simplified example form, in Fig. 1.

[0014] As shown in Fig. 1, the starting product 10 is illustrated in a Type 1:1 configuration. The reader may readily see that passing an imaginary horizontal plane (of the Type 1:1) through a bonding or glue line 12 (shown schematically as a circle) and crease 14, a single cell *C* will be traversed, passing through the crease 14. Passing a second imaginary plane through an adjacent glue line 12 and crease 14 will traverse, again, a singular cell *C*. Thus, this type of configuration is 1:1.

[0015] The reader is advised in the manner of making the starting product 10 of Fig. 1. As described in the '601 patent, the process of making the staring product 10 begins with a web, i.e., a continuous fabric, a single adhesive stripe is applied between each pre-established index for a fold, substantially closer to the open side of the proposed fold than the closed side. In appearance, a pair of adhesive stripes straddles a crease, each line equidistant from the crease and on the surface of the web that will be exposed to view. The flexibility of the web material and the functioning of fold lines or creases as permanent hinge lines permit the tubular cells to be readily and non-destructively collapsed and expanded along an axis parallel to the length of the original web as the window covering is raised and lowered, respectively, during use. Pleated sides or external ligaments *a* are parts of the web appearing between bonding lines 12 and creases 14; and internal ligaments *b* are ligaments of the web appearing only between bonding lines 12. The term "line" is used simply because, to the untrained eye, the adhesive appears to be nothing more than a (barely) discernible line of a coating material. But, it is the character of appropriate adhesives to stiffen when fully cured and thereby impart to the web an integral, transverse structural element.

[0016] Figure 2a shows the starting product 10 of Fig. 1 after selected internal ligaments *b* have been severed. Specifically, alternate internal ligaments $b_{2, 4}$ are severed, resulting in the uniform-pitch finished product 10 of Fig. 2b. In this embodiment, each cell has only a single pleat on each face. The process Fig. 2a is presently preferred, because the resulting product of Fig. 2a has pleated faces of uniform pitch. It will be apparent that the severed internal ligaments *b* may either be the "descending" internal ligaments $b_{2, 4}$, as shown in Fig. 2a, or the "ascending" internal ligaments $b_{1, 3, 5}$, provided that only alternating internal ligaments are severed.

[0017] A first alternative embodiment is shown in Fig. 3a, wherein three consecutive, adjacent internal ligaments $b_{2,3,4}$ are severed, leaving every fourth internal ligament $b_{1,5}$ intact. In other words, every internal ligament b is severed, except every fourth internal ligament $b_{1,5}$ is left intact. This sequence results in the finished product 10 of Fig. 3b. As evident from Fig. 3b, each cell has two pleats on each face.

[0018] Other alternatives result in pleated faces having non-uniform pitch, which may not be preferred for aesthetic reasons. In the method of Fig. 4a, the sequence is to cut one internal ligament b_2, leave the next three internal ligaments $b_{3,4,5}$ intact, etc. In other words, every fourth internal ligament $b_{2,6}$ is severed. This sequence results in the finished product 10 of Fig. 4b, wherein each face has a single pleat per cell, but the pleats have an alternating variable pitch resulting from the inclusion of a pair of the original, unmodified, double-cell cells remaining between each newly formed single-cell.

[0019] A further modification involves a variation of the cut one internal ligament, leave three, cut one, leave three sequence, etc. of Fig. 4a. In Fig. 5a, the sequence is to cut one internal ligament b_6, leave one internal ligament b_7 intact, cut one internal ligament b_8, leave the next three internal ligaments $b_{9,10,11}$ intact, etc. This sequence results in the finished product 10 of Fig. 5b, wherein two adjacent single-cells (rather than only one single-cell as in Fig. 4b) appear between each original double-cell.

[0020] Another alternative method is shown in Fig. 6a, involving the simple alternating sequence of cut one internal ligament b_2, leave two internal ligaments $b_{3,4}$, cut another internal ligament b_5, leave two internal ligaments $b_{6,7}$, cut another internal ligament b_8, leave two internal ligaments $b_{9,10}$, etc. In other words, every third internal ligament $b_{2,5,8}$ is severed. This sequence results in the finished product 10 of Fig. 6b, wherein only half of an original double-cell pair appears between each newly formed single-cell, and such half double-cells appear on alternating faces of the finished product 10.

[0021] Still another alternative method is shown in Fig. 7a, involving the simple alternating sequence of cut two internal ligaments $b_{2,3}$, leave one internal

ligament b_4, cut two internal ligaments $b_{5,6}$, leave one internal ligament b_7, cut two internal ligaments $b_{8,9}$, etc. In other words, every internal ligament is severed, except every third internal ligament is left intact. This sequence results in the finished product 10 of Fig. 7b, wherein each newly formed cell has a single pleat on one face and a double pleat on the opposite face, and such cells are oriented in alternating opposite directions.

[0022] The location of the glue lines 12 shown in the accompanying drawings is such that they are spaced apart from each other at approximately the one-third and two-third points in the width of the flattened product, i.e., as viewed in the accompanying drawings. The fact that ligaments *b* are to be severed in accordance with the processes of the present invention, the product 10 may be designed so that the internal ligaments *b* are initially made shorter than the width of the product 10. For example, the internal ligaments *b* can be made shorter than one-third the width of the product 10. This modified configuration can be accomplished by decreasing the spacing between the glue lines 12 of each ligament-defining pair.

[0023] Referring now to Figs. 8 and 9, the severing of the desired internal ligaments *b* is accomplished by advancing a cutting means, such as a knife blade, shown generally at 80, through the longitudinal length of the product 10. The knife blade 80 includes a blade 82 that is mounted at an angle 84 between a pilot finger 86 and a guard finger 88. Preferably, the pilot finger 86 projects further ahead of the knife blade 80 than the guard finger 88. The knife blade 80 can be mounted on the end of a rod 90 that is preferably actuated by a reciprocating means (not shown).

[0024] The knife blade 82 is advanced toward and into the cellular structure of the product 10, its path being substantially parallel to the longitudinal axis *L* of the cells. The pilot and guard fingers 86, 88 of the knife blade 80 straddle the desired ligament or septum to be cut. The cross-sectional dimensions of the pilot finger 86 and blade 82 are selected relative to the cell perimeter to assure that the cell entered by the pilot finger 86 goes tight (or flat) over the exposed blade 82, to assure proper severing of the desired ligament. It is contemplated that two properly spaced knife blades may be mounted on the reciprocating means, so that, in the case of the embodiment of Fig. 2 (where alternating ligaments are severed), two ligaments may

be severed by a single stroke of the two-blade cutting means. Following the cutting and withdrawing strokes of the knife blades, the product 10 could be indexed the appropriate distance to bring the next pair of ligaments to be cut into proper alignment with the reciprocation path of the cutting blades of the two-blade cutting means.

[0025] As an alternative to severing the desired ligaments *b* by cutting, as disclosed above, it may be desirable to establish pre-weakened severance lines in the desired locations, as by perforating the fabric, preferably prior to the pleating step. Thus, when the pleated, glued, and cured product is complete, it may be expanded in a direction to expand the cells to the point that the ligaments, which go tight first because of their length relative to that of the pleated faces, will be tensioned sufficiently to break or separate along the pre-perforated lines.

[0026] As will be understood by those skilled in the art, other sequences or patterns of cutting can be conceived without departing from the present concept of cutting the selected internal ligaments described above. For example, the principles of the invention can be applied to a starting product that is a multi-celled column type window covering.

[0027] While the invention has been specifically described in connection with certain specific embodiments thereof, it is to be understood that this is by way of illustration and not of limitation, and the scope of the appended claims should be construed as broadly as the prior art will permit.